Read Writ (2014) 27:819–839
DOI 10.1007/s11145-013-9467-y

Promoting alphabet knowledge and phonological awareness in low socioeconomic child care settings: a quasi experimental study in five New Zealand centers

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Published online: 9 August 2013

Abstract This study examined if professional development with teachers would increase children's literacy skills in low socioeconomic early childhood settings in New Zealand and would lead to changes in teachers' beliefs and practices and children's abilities over an 8 week intervention period. Research indicates that children who have alphabetic and phonological awareness on school entry are well positioned to transition from emergent to conventional literacy (Whitehurst & Lonigan, 1998). Although most children develop requisite knowledge and skills as part of early education in New Zealand, about 25 % of children do not (Nicholson, 2005) and struggle with beginning reading. One of the challenges is how teachers can foster emergent literacy within a holistic curriculum such as *Te Whāriki* (Ministry of Education, 1996), the New Zealand early childhood curriculum. A quasi experimental design was used in which teachers' and children's knowledge was pre and post tested in five early childhood centers. Teachers' (n = 32) beliefs and phonemic awareness were tested using a questionnaire. A range of literacy measures which tested alphabet knowledge, phonemic awareness, ability to recognise and write their own name and the British Picture Vocabulary Test were used with children aged 3–5 years (n = 103). Professional development was offered to teachers at the beginning of the study in four centers; the fifth center was a control. In addition, teachers' logbooks of how they promoted literacy were collected. Some changes in children's skills were found, along with some differences in teachers' beliefs and practices. The results suggest professional development with teachers to support children's literacy needs to involve more intensive coaching and guiding.

Keywords Alphabet knowledge · Phonological awareness · Teachers' beliefs · Professional development

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Introduction

Alphabetic and phonological awareness are necessary for reading acquisition and most young children develop an intuitive knowledge of sounds and can recognize rhyme and alliteration (Whitehurst & Lonigan, 1998). Although most children develop these literacy skills as part of their experiences at home and in early childhood settings in New Zealand, approximately 25 % of children do not (Nicholson, 2005). Note that 95 % of all New Zealand children aged 3–5 years participate in early childhood education prior to school entry on or near their fifth birthday (Ministry of Education, 2012). These children benefit from receiving specific alphabetic and phonological awareness instruction (Phillips, Clancy-Menchetti & Lonigan, 2008). Intervention studies that taught phonological awareness skills to children prior to school entry have showed it provides an advantage for children (Schneider, Kuspert, Roth, Vise, & Marx, 1997; Phillips et al., 2008). Many intervention studies use structured curriculums such as *Sound Foundations* (Byrne & Fielding-Barnsley, 1991), often within structured kindergartens which have reading readiness programs, including letter-name and letter-sound instruction (O'Connor, Notari-Syverson, & Vadasy, 1996), although there are some recent studies of how literacy can be promoted within more naturalistic settings (Phillips, et al., 2008; Piasta & Wagner, 2010; Justice et al., 2009). This study examined if alphabetic and phonological awareness instruction could be embedded into the holistic early childhood curriculum, *Te Whāriki* (Ministry of Education, 1996) through increasing teacher knowledge and if this would enhance children's alphabet knowledge and phonological awareness.

Professional development of teachers

Although the Ministry of Education (2003a, 2006) in New Zealand recently revised its guidelines for literacy in the primary sector in order to promote children's literacy, it has not done the same for early childhood, despite international evidence to do so (NELP, 2009) and New Zealand evidence that professional development of teachers influences decision making about curriculum and children's literacy achievement (Mitchell & Cubey, 2003). Nuttall (2005) considers three main things shape curriculum decision making: teachers' initial training; their awareness of different curricula and theories; and their conception of their own role. Wong Fillmore and Snow (2000) argue that teachers need intensive preparation in 'educational linguistics', as they gain inadequate preparation in teacher education programs. Kane's (2005) review of early childhood teacher education programs in New Zealand suggests most students get minimal preparation on literacy.

Cunningham, Perry, Stanovich & Stanovich (2004) state that literacy domain knowledge is crucial for teachers of young children. As they argue, "There are strong theoretical reasons to suspect linkages between teacher knowledge and the ability to teach reading effectively (e.g., being able to teach phonemic awareness and choose good literature" (p. 160). They found in their study of 722 kindergarten to third grade teachers that teachers' knowledge bases did not align with current

research on the role of phoneme awareness and the alphabet principle in literacy acquisition. The study found knowledge and skills related to phonemic awareness in teachers was poorly calibrated and suggested research on "knowledge calibration", to assess the relationship between teachers' perceived and actual knowledge of literacy. There is similarly little evidence that early childhood teachers in New Zealand have well calibrated literacy knowledge (Mitchell & Cubey, 2003; McLachlan, et al., 2006).

Cullen (2006) argues that complex political decision making in New Zealand has meant that the early childhood sector does not see itself as responsible for supporting children's initial competencies and skills related to literacy. She states that "lack of attention to literacy competencies and meanings could reflect a gap in initial teacher education and professional development" (p. 5). Cullen (2006, pp. 5–6) proposes three major responsibilities for teachers: to monitor gaps in children's literacy competencies as well as strengths and interests; provide curriculum that supports skills and meanings; and engage in ongoing professional development. Clearly, improving the content of teacher education programs may improve teacher knowledge, but professional development is the only option for practicing teachers.

Doubek and Cooper (2007) identify key variables for professional development for literacy: time; the importance of the role of the leader and their awareness of obstacles to effecting change; understanding what constitutes an effective literacy environment; and receptiveness to change. Mitchell and Cubey (2003) add that it builds on teachers' existing knowledge; includes alternative theoretical knowledge and practices; involves investigation and analysis of data by teachers in their own settings; involves critical reflection; inclusion of diversity; challenges beliefs and practices; and enhances insight into teachers' own thinking and actions. Internationally, there is some research to suggest that professional development can change teachers' practices and children's literacy outcomes, but these outcomes are influenced by factors such as duration and intensity of the intervention (Justice, Kaderavek, Fan, Sofka & Hunt, 2009; Phillips, et al., 2008; Piasta & Wagner, 2010; Powell, Diamond, Burchinal & Koehler, 2010; Wasik, Bond & Hindman, 2006).

Literacy research with young children in New Zealand

There is limited research in New Zealand on how teachers' promote literacy in early childhood prior to school entry and what research is available tend to be small scale studies. McLachlan-Smith (1996) examined literacy practices in 12 New Zealand kindergartens in the early 1990's, prior to the advent of *Te Whāriki*, the national early childhood curriculum (Ministry of Education, 1996). Kindergarten in New Zealand is primarily for children aged 3–5 years, while childcare is available from birth to 5 years. Findings revealed teachers espoused eclectic understandings of literacy and the amount and type of literacy experiences that children received differed according to teachers' beliefs about their role. More recent research (McLachlan et al., 2006) found that although most teachers report providing literacy rich environments, fewer than 50 % used *Te Whāriki* to support literacy and

teachers reported diverse understandings of literacy, how to promote it, or to identify and support children 'at risk'.

These findings were reinforced by Hedges (2003), who found that teachers cannot decide whether it is their role to foster literacy. Foote, Smith and Ellis (2004) found that although teachers provided rich learning experiences, when it came to literacy, they offered formal skills instruction, without being able to articulate why. Other New Zealand research has found that systematic text-free teaching of phonemic awareness at school entry reduces the incidence of reading difficulties (Tunmer, Chapman & Prochnow, 2004) and Nicholson argues there is a place for teaching phonemic awareness and simple phonics in early childhood (Nicholson, 2005). Phillips et al. (2008) also state there is a role for early childhood teachers in supporting emergent literacy, although this does not mean using formal instruction.

There are no national data on what literacy knowledge and skills children have at school entry in New Zealand, but research provides some insights. Arrow (2007) examined phonological awareness in kindergarten children, using an intervention study with 110 children to study the acquisition of reading and spelling. Arrow found children with good alphabetic knowledge have multiple pathways to reading and spelling. She found evidence of the developmental nature of phonological awareness in which each component of phonological awareness had its own sets of precursors: children's receptive vocabulary and letter-name knowledge contributed to rhyme awareness; and both rhyme and letter-sound knowledge was associated with higher levels of phoneme awareness. Blaiklock (2004) similarly found a relationship between phonological awareness and reading development, mediated by letter knowledge in children on school entry. Tunmer, Chapman & Prochnow (2006) found that children from lower SES families on school entry had lower scores for alphabet knowledge, phonological awareness and receptive vocabulary. These studies support incorporating teaching phonological awareness, alphabetic knowledge and vocabulary development in the early childhood curriculum.

There has been some Ministry of Education funded research into literacy with "at risk" children in New Zealand. Phillips, McNaughton & McDonald (2002) found that many early childhood teachers had limited knowledge of literacy and that professional development improved literacy outcomes for children. Timperley and Robinson (2001) found that teachers' perceptions of children's literacy on starting school shifted if they had their assumptions about literacy development challenged. Research by Tagoilelagi-Leota, McNaughton, MacDonald & Ferry (2005) with Samoan and Tongan children from 6 months before school entry at 5 years until a year after school entry indicated that children were supported to gain literacy skills in both their home language and English when they high quality literacy programs.

An Education Review Office (2011) report on literacy in early childhood settings provides insight into how literacy is taught into children under the age of five and what sense teachers make of the guidance available. In the review of 353 early childhood services in 2009, it was identified that although most services provided an appropriate range of literacy opportunities, a number of concerns were identified in approximately 25 % of centers regarding inappropriate use of commercial phonics packages with very young children, large formal mat times not catering to diverse abilities of children, and formal teacher led 'transition to school' programs which

limited children's engagement with meaningful literacy activities. ERO recommended to the Ministry of Education that written guidelines for literacy teaching in early childhood be developed.

Alphabetic and phonological awareness prior to school entry

So what do teachers need to know to support emergent literacy in early childhood? The term emergent literacy is used to "denote the idea that the acquisition of literacy is conceptualized as a developmental continuum, with its origins early in the life of a child, rather than an all or none phenomenon that begins when children start school" (Whitehurst & Lonigan, 1998, p. 848). Emergent literacy means children develop reading, writing and oral language concurrently and interdependently as a result of exposure to social contexts and without formal instruction (Whitehurst & Lonigan, 1998). A child's language development, home literacy opportunities and family literacy patterns are also strong predictors of literacy achievement (Sénéchal, 2006). Children who may be especially 'at risk' (Justice & Pullen, 2003) of literacy failure include children with impaired vision or hearing, cerebral palsy, intellectual disability, specific early language disorder, attention deficit/hyperactivity disorder, emotional disturbance, and speakers of other languages. A lower literacy achievement is not inevitable but children may need dedicated help to develop literacy skills (Justice & Pullen, 2003; Sénéchal, 2006; Tagoilelagi-Leota, et al., 2005).

Phonological awareness and alphabet knowledge form part of the inside-out processes that comprise emergent literacy (Whitehurst & Lonigan, 1998). These two sets of knowledge are necessary, but not individually sufficient, for the acquisition of literacy (Muter, 1994). Each has a different role to play in the development of literacy, but together they form the basis for the acquisition of the alphabetic principle, which is the understanding that speech sounds in spoken words are represented by graphemes in print (Moats, 2000). The combined knowledge means that children can use letters and their sounds to make phonemically correct representations of words when both reading and spelling (Nicholson, 2005). Differences in the levels of knowledge and awareness that children have in early childhood can impact on how they transition into conventional literacy in school (Tunmer, Chapman & Prochnow, 2006).

Phonological awareness is an important skill linked to the acquisition of literacy. This contributor to reading has been the most researched (Anthony & Francis, 2005; Stuart, 2005). Children who have been taught phonological awareness prior to school entry tend to be better equipped for learning to read and spell than children who have not (Hindson et al., 2005) and tend to be better readers (Sprenger-Charolles & Casalis, 1995).

Phonological awareness is a single ability that manifests itself in different ways at different points throughout development (Anthony & Francis, 2005). Development occurs on a continuum, in which word and syllable awareness develop first, while more advanced awareness of rimes and phonemes develop later (Anthony & Francis, 2005). Based on the assumption that phonological awareness is a single

unified ability, it is expected that rime awareness contributes to the development of phoneme awareness (Lonigan, Burgess, & Anthony, 2000). Thus teaching children rime awareness contributes to literacy development, mediated by phoneme awareness. A sensitivity to phonemes may be the first step to developing the alphabetic principle (Byrne, 1998) by providing the initial understanding that words consist of sounds. Noel Foulin (2005) suggests phoneme sensitivity is required for children to make use of letter-names in early word learning, even prior to the acquisition of the alphabetic principle.

Recent research has examined the importance of letter-knowledge in the acquisition of literacy (Noel Foulin, 2005). Alphabet knowledge provides beginning readers with the knowledge necessary to make connections between the spoken word and its print representation (Share & Gur, 1999). This knowledge of letters can continue to influence literacy achievement up to Grade 4 (Sénechal, 2006).

There are at least two ways in which alphabet knowledge is used in the acquisition of literacy; through either letter-name or letter-sound knowledge. Letter-name knowledge influences children's early spelling attempts and can make learning to read new words easier, if the words contain letter-name cues (Ehri & Wilce, 1985). Studies on novice readers have also shown a role for letter-names in the development of word knowledge before they acquire the alphabetic principle (Treiman & Rodriguez, 1999). This could be due to the use of the orthographic cues that letter-names generate; for example a two-year-old named Paige might identify any word starting with the letter P as their name because they use this letter as an orthographic placeholder. However, when children are faced with words containing the same subset of known letters they must begin to pay attention to the order of the letters when learning new words (Arrow, 2007). Children may use alphabet knowledge to assist their knowledge of letter-sounds, arguably an important skill that children develop for attempting unfamiliar words. Arrow (2007) found that children who had good letter-sound knowledge were able to make sublexical attempts at reading unfamiliar words and phonemically correct attempts at spelling unfamiliar words. Arguably the best way for children to learn to break the alphabetic code is to learn letter-sounds in conjunction with phonological awareness (Foorman et al., 2003).

According to Ehri (2005), even very young children are able to learn to read new words. Once they acquire letter knowledge and some phonemic awareness, they move from a *pre-alphabetic phase* to a *partial alphabetic phase* and new words are stored in memory, making use of partial connections between letters and sounds for storage and for attempting unknown words with those connections. Boyer and Ehri (2011) state that although spoken language is acquired easily, children require explicit teaching to learn how to segment and blend phonemes in words, because speech is perceived as an unbroken flow of sound with no pauses between phonemes in words.

The literacy policy framework in New Zealand

One of the problematic issues for early childhood teachers in New Zealand is the literacy policy framework within which they practice (McLachlan & Arrow, 2011).

New Zealand's current literacy strategy is a conglomeration of approaches the Ministry of Education (2003b) developed to counter the literacy gap highlighted in international studies of literacy and reading (e.g., PIRLS and PISA). The strategy included greater literacy-related professional development for primary teachers and support in classrooms. Other support has developed in response to the New Zealand Government Select Committee inquiry into the teaching of reading in New Zealand (New Zealand House of Representatives, 2001), such as the two new literacy handbooks for teachers, *Effective teaching of literacy: Years* 1–4 (Ministry of Education, 2003a) and *Effective teaching of literacy: Years* 5–8 (Ministry of Education, 2006).

The national curriculum document (Ministry of Education, 2007a) empowers schools to develop their own curricula. In this document the Ministry identified that children must learn to decode as well as take meaning from text. The previous document, *English in the New Zealand Curriculum* (Ministry of Education, 1994) did not reflect that children needed to learn to decode, but assumed that they were able to begin reading from the beginning. The new curriculum highlights that children need to make connections between letters and sounds, and will slowly develop a sight-word reading vocabulary and knowledge of text conventions.

The literacy learning progressions (Ministry of Education, 2007b) provide further information for teachers, providing expectations of children at school entry, and annual milestones thereafter. The progressions are based on a model in which there are three aspects to literacy acquisition: 'learning of the code'; to make meaning; and to think critically. These are also outlined in the *Effective literacy practice* handbooks (Ministry of Education, 2003a, 2006). Giving 'learning of the code' greater importance is highlighted by the inclusion of items at school entry, such as having "an awareness of rhyme and words that start with the same sound", "the ability to read their own name", "some concepts about print" and the "ability to identify the first letter of their name and some other letters" (Ministry of Education, 2010, p. 9). There is also expectation that children will be familiar with story reading. What is of concern, however, is the mismatch between the expectations of children at school entry and the early childhood curriculum document's aspirations for literacy (McLachlan & Arrow, 2011).

There is less specific guidance for early childhood teachers. An analysis of *Te Whāriki* (Ministry of Education, 1996) reveals its holistic nature; and that it is open to diverse interpretation. The curriculum is seen as "the sum total of experiences, activities and events, whether direct or indirect, which occur within an environment designed to foster children's learning and development" (Ministry of Education, 1996, p. 10). The curriculum outlines key curriculum requirements for infants, toddlers and young children, but only offers suggested experiences to guide practice. The principles of empowerment, holistic development, family and community and relationships are all relevant to literacy, but can be interpreted in many ways. Within the principles of holistic development, for instance (Ministry of Education, 1996, p. 41) it argues that "the early childhood curriculum takes up a mode of learning that weaves together intricate patterns of linked experience and meaning rather than emphasising the acquisition of discrete skills". Although

literacy includes linked experience and meaning, it also involves discrete knowledge and skills.

The major link for literacy in *Te Whāriki* is the Communication strand, in which children develop verbal and non-verbal communication for range of purposes, experience the stories and symbols of their own and other cultures, and discover and develop different ways to be creative and expressive. The strongest statements are in Goal 2, "children experience an environment where they develop verbal communication skills for a range of purposes" (p. 76), where language skills, appreciation of rhythm, rhyme, alliteration, understanding of syntax and meaning and the ability to listen to and enjoy verbal communication is encouraged. Significantly, the major predictors of literacy achievement are not mentioned; although awareness of numbers is listed in Goal 3, awareness of alphabet and phonological awareness are not mentioned.

Nuttall (2005) argues teachers do not simply apply a curriculum document and will interpret and enact curriculum in different ways. As she explains, "Instead, curriculum construction is most usefully thought of as an ongoing social construction, constantly reiterated through teachers' syntheses of reflection on their own and others' experiences (particularly those of children and families), constructs drawn from available curriculum frameworks (such as *Te Whāriki*), their own beliefs and value systems, and theoretical informants found in programmes of teacher education" (Nuttall, 2005, p. 20). Nuttall argues there is no empirical evidence that *Te Whāriki* makes a difference to children's learning but there is evidence from *Kei tua o te pae*, the early childhood assessment exemplars (Ministry of Education, 2005), that teachers are overlooking children's literacy practices in their learning stories, instead interpreting observations in terms of dispositions such as collaboration and exploration. Furthermore, *Te Whāriki* has never been evaluated, unlike the National Curriculum, which was evaluated twice prior to release of a revised document (Ministry of Education, 2007a), which interestingly is aligned with *Te Whāriki*.

The present study

Despite the caveats around the limitations of professional development to change teachers' beliefs and practices, we decided to trial an intervention within four early childhood settings, using a fifth center as a control. Our aim was to see if we could promote change in teachers' knowledge and literacy practices with children, using short term professional development. By deepening teachers' understandings, we hoped to promote change in children's literacy knowledge and skills. Our research question was:

> Does professional development for early childhood educators on facilitating alphabetic and phonological awareness contribute to growth in alphabetic and phonological awareness in 3–5-year-olds in full-time center-based care?

Our objectives were twofold:

1. To examine if professional development can improve teachers' knowledge regarding facilitating alphabetic and phonological awareness in 3–5 year old children.
2. To examine if children's alphabetic and phonological awareness can be enhanced within a holistic, child centered curriculum context within an 8 week period.

Methods

Research design and participants

A quasi experimental design was used in which teachers' and children's knowledge was tested at the beginning and end of a data collection in five New Zealand early childhood centers. The five centers were recruited to participate in professional development on facilitating alphabetic and phonological awareness. The intervention was designed to be conducted over several weeks, beginning with pre testing of teachers' and children's knowledge of phonological and alphabetic awareness. One center was a control, whereby teachers did not receive the professional development until after the intervention period, so we could evaluate whether any changes were the result of typical development, rather than changes in resources, activities or teaching practices. The research involved the following phases:

1. the pretesting of children and teachers;
2. an intervention comprising a 2 h professional development meeting;
3. an implementation period of approximately 8 weeks; and
4. the posttesting of children and teachers, and the collection of each center's logbook.

The Ministry of Education national database of early childhood centers was used to identify eligible centers in the city and then local knowledge was gleaned from practicum coordinators in our College to decide which centers to approach. Centers were targeted that had children who were primarily in full-time child care, and from a range of family and SES backgrounds, although we set out to recruit centers which were situated in lower SES areas, avoided higher SES areas and centers attached to tertiary education institutions. We wanted a high proportion of children from low SES backgrounds, as coming from a low SES background is one predictor of reading failure in young children in New Zealand (Tunmer, Chapman & Prochnow, 2006).

At the end of the data collection it was discovered that no teachers at one of the intervention center had participated in both pretesting and posttesting, and only five children had completed all data collection. As a result, this privately owned full day care center was dropped from the analyses. The composition of the remaining sample in each setting is described in Table 1. Not all children were post-tested as some did not want to participate and some had started primary school. The total

Table 1 Composition of sample

Center	Ownership model	Type	No. teachers	Teacher all data	Children with all data	Children excluded
Center 1	'Not for profit'	Full day care	6	4	17	12
Center 2	'Not for profit'	Sessional, parent educators	8	3	21	13
Center 3	Private	Full day care	4	4	5	6
Center 4	Private	Full day care	8	5	12	0

Centers 1–3 are intervention centers and center 4 is the control group center

number of children included in the analyses is indicated in the last column of Table 1. Not all teachers completed the data collection, thus the number of teachers from each center that did is also indicated in Table 1.

Teachers

Across the five centers 32 teachers completed pretests or posttests and a total of 16 teachers completed both pretesting and posttesting data collections. The sample was all female and five (31.3 %) had Bachelor's degrees, three (18.8 %) held a Diploma in Teaching, two (12.5 %) held Graduate Diplomas of Teaching in early childhood education, three (18.8 %) were currently in training, and a further three (18.8 %) held no qualifications. There were no differences between the intervention and control centers in the distribution of qualifications (Mann–Whitney $U = 30$, $Z = .28$, $p = .77$). Overall, however, the number of teachers in Center three that completed all data masks that the majority of adults in the center at any one time are parent educators, most of whom did not complete all data collection tasks. The number of years spent teaching varied from half a year to 24 years ($M = 8.84$ years, $SD = 8.79$), with no differences in distribution across intervention and control centers (Mann–Whitney $U = 31$, $Z = .41$, $p = .68$).

Children

Of the children who participated, 55 children (30 boys, 25 girls) completed the data collection at both pretest and posttest. There were 43 (23 boys, 20 girls) children across the intervention centers and 12 in the control center (7 boys, 5 girls). The mean age of children in the intervention group was 50.51 months ($SD = 5.12$, 36–58 months) and the mean age of children in the control group was 48.92 months ($SD = 4.87$, 39–56 months). There was no significant difference in children's age between intervention and control centers (Mann–Whitney $U = 232.5$, $Z = -.521$, $p = .60$). An additional 27 children, all from the intervention group, did not complete the data collection for both times. Of those children, 11 moved onto primary school, which New Zealand begin on their fifth birthday. The remaining 16 were either absent at one or more collection points, or chose not to participate. Inspection of the data collected at any one time from the 27 children who are not

included in the final analysis indicates that there are no differences in performance on measures. The only difference in measures was that the 11 who went onto primary school were older with a mean age of 58.18 ($SD = .98$) at pretest.

Measures

Teachers

Teachers were asked to complete a *questionnaire on current practices* concerning alphabetic and phonological awareness, based on surveys previously used for assessing teachers' beliefs about literacy (Taylor, Blum & Logdon, 1986; McLachlan-Smith, 1996; McLachlan, et al., 2006). The questionnaire has three components. First, it identifies teachers' perceptions of opportunities they afford children within the center. Thirteen questions were scored to provide a measure of literacy opportunities, with a higher score indicating a high level of opportunity for literacy activities. The second component examined teachers' recognition of children's emergent literacy abilities, such as writing, reading signs, and alphabet recognition. This component has a maximum score of 7. Finally, teachers' role and knowledge of literacy development was examined. Teacher responses to this are analysed in a qualitative manner. Teachers were also asked to complete a *phonological awareness assessment* requiring phoneme segmentation (adapted from Moats, 2000). The maximum score for this assessment was 30. Finally, teachers were asked to keep a *logbook* of the activities initiated on literacy during the intervention period.

Children

Children's data was collected with children in a quiet corner of the center. Most children had their data collected over several sessions at both pre- and posttest, stopping a session at their request. The first set of tasks at both pretest and posttest for children were phonological awareness measures. In the first task, *rhyme identity,* children were presented with four pictures, all of which were named by the researcher. The first is the cue word and the remaining three are the target and distracter words. Children are asked to identify which of the three rhyme with, or end the same as, the cue word. This is a measure of implicit rhyme awareness. There were eight items with two practice items.

The second phonological awareness task assessed *onset identity*, whereas in the rhyme identity task, children were presented with four pictures. In this task children were asked to identify which of the three words began the same, or started the same as, the cue word. This is a measure of implicit initial phoneme awareness. There were eight items with two practice items.

There were two additional phonological awareness tasks which were developmentally more advanced than the identity tasks (Anthony & Francis, 2005). The *onset labeling task*, was administered if children scored four out of eight on each of the identity tasks. As onset labeling requires explicit awareness it was not administered to children who did not yet appear to have implicit awareness. In this

task children were provided with a picture of the cue word and asked to name the first sound of that word. There were eight items with two practice items. This was followed by a *phoneme blending* task in which children were provided with the phonemes of three to four phoneme words and asked to put the sounds together to identify what the picture was on a card placed upside down in front of them. The phonemes were presented with a 3-second gap between them. There were six items and two practice items for this task. Very few children were able to complete these tasks, thus they are not included in the analysis of findings.

Children's emergent literacy skills were also assessed through a number of tasks. The first tasks assessed children's *letter knowledge* in which children were presented with each of the 26 alphabet letters in a set random order in lower case. Letters were individually presented using an index-card sized flip chart. Children were asked to name the letters they know. All letters were presented as children learn different letters at different times (Justice, Pence, Bowles, & Wiggens, 2006). They were provided feedback on the first letter. As letter-sound knowledge lags behind the letter name knowledge of New Zealand young children (Arrow, 2007), a letter-sound task was given to children who had scored 12 or more on the letter-name task. The procedure for this task was identical for the letter name task, but with letter-sounds.

Own-name knowledge was also assessed by providing children with presented with their name printed on A4 paper in a standardized sans serif font. Children were not told what it was, but simply asked what the word said. This was immediately followed by children being asked to write their own name on a piece of A4 paper, but without the printed name in front of them. Finally, children's *receptive vocabulary* was assessed at pretest only, using the British Picture Vocabulary Scale (2nd edition, Dunn, Dunn, Whetton, & Burley, 1997).

Procedures

The child pre-test data was collected first, and once all the pre-tests on children had been completed, a time was scheduled to meet with the teaching team in each of the intervention centers to provide the one-off professional development event. This event took approximately 2 h for each center and included the completion of the teacher phonological awareness assessment and survey.

The professional development session focused on research evidence of how literacy develops and the inside-outside nature of literacy acquisition (Whitehurst & Lonigan, 1998). It also explored the predictors of literacy acquisition (NELP, 2009), but focused primarily on the particular importance of alphabet knowledge and phonological awareness in children's literacy acquisition. This focus was linked explicitly to evidence based effective pedagogies for story reading, language and rhyming games, learning alphabet and vocabulary (e.g., Justice & Pullen, 2003; Justice et al., 2009; Phillips, et al., 2008; Piasta & Wagner, 2010) which support the predictors of literacy acquisition (NELP, 2009). Teachers were then asked to consider how they typically offered literacy opportunities in their center in relation to the content of the current professional development session and new strategies for promoting literacy were brainstormed and critiqued by the researchers and

participants. After the professional development, teachers were asked to implement any brainstormed ideas or later thoughts for a period of approximately 8 weeks and to keep brief records of how they had implemented these ideas.

At the end of the intervention period, activities were offered to children again, and teachers were asked to repeat the survey. Once data were analyzed, we returned to centers to discuss the pre and post data that we had collected with children, teachers' logbooks and implications for teaching practice. In the control center the professional development program was offered after all data was collected, where the implications of the pre and post test data for teaching practice were discussed.

Findings

The findings are discussed by each form of data collected. The teacher data will first be examined to identify the differential influences of the professional development and the non-provision of the professional development on teaching practices. This will be followed by an examination of the children's data to identify if the professional development influenced children's development. All significance testing is set at an alpha level of .01 to reduce the possibility of Type 1 error rates with the comparison of a number of measures across time for the children.

Teachers

Although the intervention centers differed in terms of ownership models, with one private and two non-profit centers, as well as full day care and sessional care, the overall philosophy of childhood education was similar across centers. All followed the national curriculum, *Te Whāriki* (Ministry of Education, 1996). Although one center was sessional, the nature of full day care in the New Zealand setting means that children attending full day care centers may be attending for similar hours as those attending sessional care centers. Center three had a large number of parent educators in the center at any one time, but it was the teachers in paid employment that completed both pretest and posttest measures and were responsible for curriculum planning, like the other centers.

Content and thematic analyses were conducted on open ended questions of the survey using the method suggested by Creswell (2002). Each question was read and coded against a list of emerging themes per question. Once all surveys were coded, the lists of identified themes for each question were collated and the frequency of responses against identified codes was analyzed. The data were also scrutinized to check if any questions were not answered and in what frequency, and if any predicted themes, such as promoting alphabet knowledge or phonological awareness, were absent from the data.

The thematic analysis of open-ended questions regarding literacy opportunities for children found that intervention centers considered they provided language and literacy rich environments for children through the provision of songs, name tags, books, posters, games, music, and puzzles. This did not change for any center type across the course of the intervention. At both pretest and posttest the intervention

centers indicated that they provided one or both of book corners and writing centers. The provision of time for literacy was variable across the intervention centers, with center one indicating that they had a specific time for literacy, aimed at the oldest of the children who were about to start school. The other intervention centers indicated no specific literacy time but said it was embedded throughout the day. In general, however, the responses reflected a belief that their role was to provide literacy resources rather than explicit, planned for, literacy experiences. The control center differed slightly from the intervention centers in that the main belief for teacher role was to provide literacy experiences rather than just resources, from pretest. Overall, the teachers indicated that they provided literacy across the center as a whole, with no one environment encouraging literacy and they did mention signs, labels and name-tags across the center. The control center indicated literacy activities occurred at whole-group mat-times and throughout the day and that most teachers thought that story reading was useful for building on children's interests or extending imaginations.

The teacher results are analyzed in terms of teachers' perceptions of the provision of literacy opportunities for children and teachers' understanding of literacy and their role in facilitating literacy development. The control center identified nearly twice more, on average, literacy opportunities for children than the intervention centers did, at pretest (see Table 2). However, the control center also had large within-center variation and an overall drop in the opportunities indicated between pretest and posttest. There was some variability in the number of opportunities provided within centers with a main effect of center type, $F(1, 14) = 11.28$, $p = .005$, $\eta^2 = .45$, with the control center indicating more opportunities than the intervention group of teachers. There was no main effect of time, $F(1, 14) = .48$, $p = .499$, $\eta^2 = .03$, explained by the small change in the intervention group (see Table 3) being offset by the decrease in the control group. As a result of those changes the interaction had a higher F-score that was still not significant, $F(1, 14) = 5.12$, $p = .040$, $\eta^2 = .27$.

Understanding how children develop literacy did not appear to be well understood, with no mention of specific forms of knowledge that children would develop, or ideas of developmental progression of emergent literacy skills. The majority of responses to the question on how children develop literacy referred to

Table 2 Descriptive statistics for teachers in the sample

	Intervention ($n = 10$)	Control ($n = 5$)
Years experience	7.45 (7.35)	10.20 (11.71)
Qualification level[a]	2.64 (1.12)	3.80 (1.64)
Pretest opportunities identified	22.64 (5.07)	40.00 (15.06)
Posttest opportunities identified	26.45 (4.08)	33.40 (11.87)
Pretest phonological awareness	13.40 (2.07)	18.60 (4.04)
Posttest phonological awareness	14.50 (3.78)	15.40 (2.88)

[a] 1 = not trained, 2 = in-training toward a qualification, 3 = diploma or certificate, 4 = bachelor degree, 5 = bachelor degree and post-graduate qualification

Table 3 Pretest and posttest means for intervention and control groups

	Intervention (N = 43)		Control (N = 12)		Total (N = 55)	
	Pretest	Posttest	Pretest	Posttest	Pretest	Posttest
Age in months	50.51 (5.12)	–	48.92 (4.87)	–	50.16 (5.07)	–
Vocabulary SS	92.60 (10.55)	–	99.33 (11.06)	–	94.09 (10.93)	–
Rhyme identity	3.47 (1.76)	4.07 (1.75)	4.08 (1.68)	3.91 (1.44)	3.60 (1.75)	4.04 (1.68)
Onset identity	2.84 (1.45)	3.40 (1.80)	2.83 (1.64)	2.50 (1.31)	2.84 (1.48)	3.20 (1.73)
Own name reading	.74 (.44)	.76 (43)	.42 (.52)	.75 (.45)	.67 (.47)	.76 (.43)
Own name spelling	.30 (.46)	.48 (.51)	.42 (.51)	.42 (.51)	.33 (.47)	.46 (.50)
Alphabet names	5.53 (6.45)	6.69 (6.52)	6.17 (7.18)	6.33 (7.24)	5.67 (6.55)	7.67 (6.30)

Own name reading and spelling scored as 0 = not correct and 1 = correct

the learning environment, with language and literacy rich environments the main response across all centers, followed by children being read to and being immersed in literacy. This was also reflected in the responses to what teachers perceived that story reading does for children. All teachers thought that story reading was useful for building on children's interests or extending imaginations. Very few teachers indicated that story reading was useful for literacy skills. This changed at posttest, where they stated that storybook reading could be used to build on literacy skills. Also reflecting teachers' knowledge were responses to their role in children's literacy development to which the main responses included reading to children, encouraging language development, and providing literacy resources. This remained the same across pretest and posttest except for changes in the belief that the teacher's role is to facilitate language development for literacy to facilitating literacy itself. Also of interest is the majority response of 'no response' to how the teachers made use of the early childhood curriculum in their planning for literacy.

The ways in which intervention centers supported literacy throughout the intervention period were quite similar, possibly stemming from discussions at the professional development program. Strategies listed in the center logbooks included being more conscious of emphasizing sounds in words; pointing out alphabet to children; emphasizing names and writing of names on artwork; encouraging writing of stories; adapting songs and rhymes to suit centers' cultural context; increased story reading, language games, rhymes and songs throughout the session; and focused four year old sessions on letter-sound relationships. Although reported as a control center for comparison with the intervention, the control center does not reflect the general practices of early childhood centers in New Zealand, as discovered through the posttest questionnaire where one of the control center teachers commented that "Since viewing the questions your researchers were asking our children… I have instigated and supervised a specific letter recognition and

sounds program". This response meant that the control center, although they indicated they understood they were to be the control center, went on to carry out a more formal skills based intervention than that being facilitated through the professional development for the intervention centers.

Overall teacher knowledge of phonological awareness was low. The average score on phonological awareness was 15.13 ($SD = 3.72$) at pretest, and at posttest that dropped to 14.80 ($SD = 3.43$). A repeated measures ANOVA was conducted. The drop from pretest to posttest was not significant, $F(1, 13) = 2.13$, $p = .168$, $\eta^2 = .14$. There was also no main effect of intervention group, $F(1, 13) = .3.66$, $p = .078$, $\eta^2 = .22$, indicating no change in phonological awareness in the intervention group even with specific instruction in it during the professional development session. There was an interaction that just reached the significant alpha level of .01, $F(1, 13) = 8.93$, $p = .010$, $\eta^2 = .41$, which reflects the drop across time of the control group teachers and the slight increase of intervention teachers. The drop for control teachers can be explained by the nature of the administration whereby the pretest forms were completed prior to the researchers meeting with the staff at the center, and the posttest forms were completed in a session with the researchers. As only two of the five teachers represent the decline in score it is thought that the two teachers sought out the answers to the questions but did not understand it sufficiently to transfer that to the posttest scores as well. In addition, neither co-variate was significant either.

Children

Overall, children made small developmental gains over time (see Table 3). To examine the children's literacy development across time repeated measures ANOVA were conducted. As multiple ANOVA were conducted, one for each measure, Bonferroni adjustments were used for each ANOVA. Rhyme awareness did not show any significant change, with no main effect of time, $F(1, 53) = .52$, $p = .475$, $\eta^2 = .01$ and no main effect of intervention, $F(1, 53) = .24$, $p = 624$, $\eta^2 = .01$. There was also no interaction, $F(1, 53) = 1.61$, $p = .210$, $\eta^2 = .03$. Onset awareness did not show any significant change, with no main effect of time, $F(1, 52) = .21$, $p = 647$, $\eta^2 = .00$, and no main effect of intervention, $F(1, 52) = 1.00$, $p = .323$, $\eta^2 = .02$. There was also no interaction, $F(1, 52) = 2.67$, $p = .108$, $\eta^2 = .05$. However, the scores generally did move from below the chance score level of 3, to a mean of 3.20.

Letter name knowledge showed a main effect of time that was not significant at the set level of significance of .01, but $F(1, 52) = 5.52$, $p = .023$, $\eta^2 = .01$. This was explained by the growth in letter name knowledge of the experimental group, but the main effect was reduced by the very small change of the control group. There was no main effect of intervention, $F(1, 52) = .02$, $p = .884$, $\eta^2 = .00$, and no significant interaction, $F(1, 52) = 3.53$, $p = .066$, $\eta^2 = .06$. Name reading and name spelling ability are the last measures. Name reading showed no main effect of time, although it neared the set significance level, $F(1, 52) = 5.06$, $p = .029$, $\eta^2 = .09$. There was also no main effect of group membership, $F(1, 52) = 2.05$, $p = .158$, $\eta^2 = .04$. The interaction neared significance, like the main effect of

time, $F(1, 52) = 5.06$, $p = .029$, $\eta^2 = .09$. The near significant effects and interaction were due to the increase in own name reading ability of the control group, and lack of change of the intervention group. In contrast, the intervention group made a greater increase in name spelling ability, and the control group made no change. However, there was no significant main effect of time, $F(1, 52) = 1.37$, $p = .247$, $\eta^2 = .03$, or group, $F(1, 52) = .03$, $p = .870$, $\eta^2 = .00$. There was also no significant interaction, $F(1, 52) = 1.37$, $p = .247$, $\eta^2 = .03$. The children's results don't appear to match what the teachers were attempting to do.

Discussion

Not all teachers in this study had a recognised teaching qualification, so it is not surprising that some had difficulty in answering questions about literacy. However, the finding that the qualified teachers had limited understandings of phonological awareness was of concern; the teachers' knowledge of phonological awareness did not improve with the professional development either. What did change were teachers' understandings of what their role should be in the provision of literacy for children. All teachers believe in providing resources and literacy rich environments, including reading to children, but prior to the intervention they did not consider the explicit teaching of alphabet knowledge or phonological awareness. As an example, the teachers did not initially understand the value of storybook reading for developing children's alphabet knowledge or phonological awareness. Additionally, very few intervention centers provided phonological awareness or alphabet specific activities; although this increased, according to the intervention teachers, after the professional development session, where they did identify the usefulness of such activities for literacy development. The intervention teachers also recorded changes in practice in which such activities became more explicit and part of their teaching.

Also of concern was the finding that many teachers did not comment on using the early childhood curriculum, *Te Whāriki* (Ministry of Education, 1996), for literacy planning, although this finding is consistent with earlier studies (McLachlan et al., 2006) and supports Nuttall's (2005) proposition that teachers do not simply apply a curriculum document. ERO's (2011) recommendation that teachers need greater guidance has further support with these findings.

Initial interpretations of the child data leads us to conclude that children's phonological awareness and alphabet knowledge cannot be enhanced in holistic early childhood settings, when short term professional development is provided to enhance it, any more than would occur in settings prior to explicit professional development. This finding is consistent with findings by Mitchell and Cubey (2003) and Doubek and Cooper (2007), suggesting teachers need greater involvement over time for changes in beliefs and practice to occur. These data do not suggest that the teachers' reported changes in practice have made any significant difference to children's literacy outcomes, although teachers reported children's engagement with the new pedagogies and activities they offered. Further research is needed to identify more explicitly what teachers are doing to support literacy in the early childhood setting and whether practice could be strengthened to support children's

developing literacy knowledge and skills. The issues of more time or enhanced teacher practice are worthy of further research. These findings do however support Cunningham et al.'s (2004) proposition that teachers' need strong knowledge calibration to be effective teachers of literacy.

What is also clear is that many children in this study needed further literacy opportunities to support the literacy knowledge and skills required at school entry. The children's results parallel those of Tunmer, Chapman and Prochnow (2006) and are much lower than Arrow's (2007) findings with a higher SES group of children the same age, suggesting that some of these children are potentially 'at risk'. High quality literacy teaching in these low SES settings is clearly implicated, as well as teachers having access to appropriate guidance on how to support children who may be 'at risk' of reading failure.

Conclusion

This study suggests that although short term professional development did not make significant changes to teachers' knowledge or to children's literacy outcomes, it is possible to integrate teaching of phonological awareness and alphabet knowledge into early childhood settings in meaningful ways, without resorting to formal instruction and also to raise teachers' awareness of how using literacy resources in different ways may increase children's literacy outcomes (Justice et al., 2009). Unfortunately, this study does not show a strong relationship between teachers' reported teaching practices following professional development and increases in children's literacy outcomes. Although teachers suggest they do provide a literacy rich environment, further research is needed within early childhood settings to identify how teachers can more effectively support literacy development in young children. We propose that researching on-going professional development programs which utilise coaching and feedback on specific teaching strategies for promoting literacy outcomes are likely to be more effective.

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